S-E-C-R-E-T

CODIB-D-111/1.6/5
30 January 1967

UNITED STATES INTELLIGENCE BOARD

COMMITTEE ON DOCUMENTATION

MEMORANDUM FOR: CODIB Members

SUBJECT: Final Report of Task Team VI - Research and Development

1. Attached is a final report of Task Team VI - Research and Development as revised in response to comments by members on the earlier version.

2. This will be on the agenda for preliminary discussion at the CODIB meeting on 28 February.

[redacted]
Secretary

25X1A

Attachment: a/s

Group 1
Excluded from automatic downgrading and declassification.

CODIB-D-111-1.6/5
30 January 1967

UNITED STATES INTELLIGENCE BOARD

COMMITTEE ON DOCUMENTATION

TASK TEAM VI - RESEARCH AND DEVELOPMENT

REPORT ON INTELLIGENCE DATA HANDLING RESEARCH AND DEVELOPMENT

S-E-C-R-E-T

T/VI/R-2
30January 1967

UNITED STATES INTELLIGENCE BOARD

COMMITTEE ON DOCUMENTATION

TASK TEAM VI - INTELLIGENCE DATA HANDLING

RESEARCH AND DEVELOPMENT

MEMORANDUM FOR: Chairman, Committee on Documentation

SUBJECT: Transmittal of Task Team VI Report

REFERENCE: Task Team VI Report on Intelligence Data Handling Research and Development, 28 September 1965

1. Attached hereto is the revised version of the referenced report.

25X1A

[redacted]

Chairman, CODIB Task Team VI

Attachment:
Revised Task Team VI Report

Group I
Excluded from automatic
downgrading and
declassification.

S-E-C-R-E-T

T/VI/R-2
30 January 1967

U N I T E D S T A T E S I N T E L L I G E N C E B O A R D

COMMITTEE ON DOCUMENTATION

TASK TEAM VI - RESEARCH AND DEVELOPMENT

Report on Intelligence Data Handling Research and Development

TABLE OF CONTENTS

Group I
Excluded from automatic
downgrading and
declassification.

I. INTRODUCTION

A. The Committee on Documentation (CODIB) directed Task Team VI to concern itself, within the scope of the CODIB mission, with research and development associated with improvement of techniques for handling intelligence data. Two terms, "Intelligence Data Handling" and "Documentation", were defined to establish a basis for understanding both the CODIB assignment and the Task Team's response to it.

1. The term "Intelligence Data Handling", adopted by the Task Team as a convenient descriptor of the area of research and development to be studied, is defined in the Task Team VI Terms of Reference (Appendix 3) as follows:

> "...intelligence data handling is interpreted to include the processing of intelligence data among and between humans and machines. It includes the functions of receipt from collection sources, transformation, coding, storage, search, retrieval, manipulation, presentation and delivery and it involves usage procedures. It is concerned with existing and potential techniques, both manual and automated which offer promise of improving intelligence data handling techniques..."

2. The scope of the CODIB mission and, in turn, the framework within which "Intelligence Data Handling" research and development (IDH-R&D) must be studied is indicated by the definition of "documentation" contained in DCID 1/4 of 23 April 1965:

> "Documentation is defined as the group of techniques necessary for the orderly presentation, organization and communication of recorded specialized knowledge, in order to give maximum accessibility and utility to the information contained."

B. Even with the clarity of definition attempted above, it is evident that a reasonably comprehensive consideration of all the aspects of data handling within the USIB community would be so all-encompassing as to be meaningless and lacking in utility. On the other hand, an exhaustive technical treatment of a few areas to the exclusion of the majority considered of import in the definition would present a distorted picture and would tend to hide, through omission, gross problem areas deserving of attention by the USIB community.

C. In what appears to be an effective compromise, the Team has prepared a report which attempts to provide the data necessary for

answering such pressing questions as:

1. What policy mechanisms should exist for establishing a USIB community program in intelligence data handling research and development?

2. Are the existing and planned IDH-R&D programs adequate in size, balanced in content, technically sound and adequately organized, managed and funded to attain the desired objectives?

3. In what ways can the scientific and technical leadership in intelligence data handling R&D be improved?

4. What are the outstanding opportunities in IDH-R&D and in practical applications which represent the difference between existing and planned programs and reasonable objectives?

5. What is the primary mechanism by which shortcomings in existing operational procedures, practices, techniques or equipment in IDH are translated into research and development requirements and communicated to the technical leadership of the USIB R&D community? How can this mechanism be improved?

6. Are there criteria for determining in which areas of intelligence data handling research and development the USIB community must be self-sufficient, need not be self-sufficient or should not be self-sufficient?

7. To what degree are the intelligence data handling research and development programs of the several USIB members mutually supportive?

D. In addition to providing the basic data and statistics in the Appendices, the report suggests an interpretation of the data in the light of the paramount questions isolated above. Further, experience of team members and resources available to them were utilized to provide possible and feasible answers to the questions. Because of the nature of the questions, the recognized diversity of interest of members of the USIB community, the limitations imposed by security and the magnitude of the subject area, much of the supporting data is illustrative or inductive in nature, rather than

exhaustive or deductive. The Team admits the danger of this type of evidence and recognizes the criticism which can be levied upon this approach; however, it pleads the impracticality of any other method and believes itself capable of defending in some detail the recommendations and conclusions contained in the report.

E. It is worth emphasizing that the Team considered conceptual and managerial aspects of R&D and R&D program establishment and organization to be more crucial and more in need of immediate attention than purely technical aspects. Accordingly, one will not find recommendations in the report concerning what technical approaches should be adopted, what type of equipment is best suited to a particular application, and the like. These aspects are considered secondary to the primary problem of establishing and attaining an adequate, effective research and development program for intelligence data handling within the USIB community. Furthermore, such specific listings of technical projects will be a natural fall-out of any successful R&D program.

F. The layout of the report represents the above-stated views of the Task Team. Section II deals with conceptual and managerial considerations and Section III with technical aspects of intelligence data handling research and development. These are followed by a section devoted to the allocation of resources for intelligence data handling research and development which represents the major portion of the data collection effort undertaken by the Task Team. Sections V and VI touch on isolated but important facets of intelligence data handling R&D; namely, the self-sufficiency of the USIB community in this R&D area and the primary processes involved in intelligence data handling. Finally, Section VII contains the Team's recommendations. Some of the recommendations have been identified as being of immediate urgency. Each such recommended action is accompanied by the Team's estimate of the impact of the action on the funding and personnel resources of the USIB community. Estimates of the impact of the other Team recommendations on USIB community resources have not been calculated; however, such estimates can be provided upon request.

G. It is important to take into account the membership of Task Team VI in reviewing the recommendations and conclusions. Contributing members were drawn from CIA, OSD, DIA, Army, Navy, Air Force and NSA. (A complete membership list of individual names is contained in Appendix 3). It is worthy of note also, since ramifications will be felt in several of the conclusions and recommendations, that 1) the FBI had no member because prior to FY66 it had no funded R&D in

intelligence data handling, 2) the AEC volunteered no member although it sponsors R&D efforts considered within the Task Team's purview, and 3) the State Department supplied an observer[1] even though it had no funded R&D efforts in intelligence data handling. The National Science Foundation supplied consultants to the Task Team and the CODIB Support Staff provided a professional to serve as executive secretary.

H. The SCIPS report served as a valuable background for Team members and provided more pertinent data as basis for Team findings than any other single collection of material.

[1] An observer rather than a member since the State Department felt it had no one who could actively participate in the work of the Task Team.

II. CONCEPTUAL AND MANAGERIAL CONSIDERATIONS CONCERNING INTELLIGENCE DATA HANDLING RESEARCH AND DEVELOPMENT

A. The Task Team attempted to find a framework of R&D goals within the USIB community upon which to attach specific managerial and technical tasks and within which to isolate gaps, deficiencies, achievements and highlights pertinent to intelligence data handling research and development. In its investigations, the Task Team discovered instead that the intelligence community, as governed by USIB under the documented series of NSCIDs and DCIDs (National Security Council Intelligence Directives and Director, Central Intelligence Directives), has neither an organized set of R&D objectives, a policy for establishing R&D objectives nor a mechanism for accomplishing either[1]. This lack of objectives and policy is not surprising insofar as it appears to be analogous to that in the Federal Government as a whole; i.e., there are no explicitly stated federal or national R&D goals. However, there is a formal mechanism within the executive branch of the government for advising the President on R&D matters, for coordinating federal agency R&D programs and for isolating specific areas for concentrated study, improvement or change. This mechanism is comprised of the Scientific Advisor to the President, his staff in the Office of Science and Technology, and the Panels and Committees over which he presides. The USIB community, as part of the federal structure, is represented within this mechanism only insofar as its member agencies are individually represented. In addition, the USIB community in many ways and for many reasons functions as a self-contained entity isolated from the rest of the federal structure by organizational, managerial and security barriers. This isolation causes little or no confusion in operational matters. Such is not the case with respect to scientific and technical responsibilities of the USIB community. Here the community is not self-sufficient. These activities -- managerial, research, development, test, engineering, evaluation and implementation responsibilities -- are delegated or

---

[1] Two exceptions were noted; namely, 1) NSCID 6 dated 18 January 61 which stated that NSA was assigned the responsibility for "conducting research and development to meet the needs of NSA and departments and agencies which are engaged in COMINT or ELINT activities; and coordinating the related research and development conducted by such departments and agencies", and 2) NSCID 8 dated 18 Jan 61, which stated that "The NPIC shall engage in or sponsor, as appropriate, the development of specialized equipment for the intelligence exploitation of photography and shall provide information about such specialized equipment to interested elements of the intelligence community for their own possible use or further adoption."

assigned in part or sometimes wholly to groups outside the community. With respect to intelligence data handling R&D, the Task Team believes such delegation to be useful and many times to be essential. This viewpoint is justified on the basis of one or more of the following reasons:

1. The greater part of the technical competence in general information handling (or information sciences technology) lies outside the intelligence community. This is not the case for certain specific areas as will be discussed later. (See Sections II and V).

2. Many aspects of intelligence data handling are identical to those of general information handling. (See Section V). As a result, R&D costs for effecting improvement could be so parcelled out within the federal agency structure that no agency or group, e.g., USIB, needs to bear a disproportionate share of the cost.

3. Sharing the R&D costs for common needs with other agencies will permit the intelligence community to concentrate its limited resources on those intelligence data handling efforts which are of unique or primary concern to it.

B. It is emphasized that the concentration of IDH technical competence outside the intelligence community is not alarming; however, the lack of competence within the intelligence community in the applications of IDH techniques to intelligence problems or systems is of critical concern. The Task Team believes that at present such inherent competence is marginal at best. This belief is borne out by documentable evidence concerning large, unsuccessful system projects within the community; frequent use of contractors for system design and development; the current mediocrity of IDH systems; and the lack of evidence of concrete planning for application of more sophisticated technology as manifest in existing budgetary plans. The task of documenting what is now just anecdotal experiences in support of the above indictments would be justified only if one could attest to learning by experience. The Task Team cannot so attest; therefore, supporting documentation is not a part of this report.

C. It is frequently asserted that lack of Federal or national objectives can be compensated by the existence of well-structured and documented individual agency objectives. The implication of this premise to the USIB community would be that well-founded member agency objectives in IDH-R&D would form a suitable substitute for corresponding

community goals. The Task Team attempted, therefore, to isolate individual agency objectives in order to assess their suitability. The factual results of this effort are contained in Appendix 1. It was determined that DIA, the Military Departments, and NSA have documented objectives. The State Department had none. The existence of CIA objectives was not determined and the NSA objectives were not released to the Task Team. It was obvious, however, that the objectives isolated were not uniform in structure, were neither comprehensive nor cohesive, were grossly incomplete with respect to managerial considerations, and were not intended as guidelines for R&D efforts. The Task Team was forced to conclude that the accumulation of individual agency objectives could not be used as a substitute for USIB objectives and that the individual objectives themselves were of little use in judging or relating R&D efforts planned or underway.

D. The Task Team had extreme difficulty in isolating those personnel and staff elements responsible for IDH-R&D management or development, (See Section IV B), and certainly found nothing to indicate existence of a structured IDH-R&D "community". Many individuals who acknowledged responsibility for IDH projects were not even aware of anyone else having similar responsibilities. There is little evidence that the IDH-R&D personnel in one agency make adequate effort to identify their counterparts in other agencies and exchange information with them. Similarly, these personnel appear to make little use of the R&D information services available to them as government employees. In this latter regard, there appears to be no evidence that the technical personnel concerned with IDH-R&D differ from other government technical personnel. Accordingly, the DoD study of the information usage habits of government scientists and engineers[1] should be applicable to IDH-R&D technical personnel, and, in the view of the Task Team, eliminates the necessity for a separate survey of the intelligence community. Most evidence, including that compiled in the referenced DoD study, points to either misuse or inadequate use of R&D information services by technical personnel who lack training in the proper use of such services.

E. An analysis must be made of the possible means of establishing a feed-back mechanism between the users of intelligence estimates and of finished intelligence and the IDH-R&D community. There is evidence that intelligence estimates and final products of all types are oftentimes lacking in completeness, objectivity and accuracy. In this regard, there is no apparent mechanism through which the users of intelligence estimates and finished intelligence products can provide comments to IDH-R&D personnel.

---

[1]DoD User Needs Study, Phase I, Volumes I & II, 14 May 1965, Auerbach Corporation.

In fact, such users have neither an effective manner of challenging such estimates nor adequate criteria for judging when they should be challenged. It is essential that estimates be analyzed by the IDH-R&D community for evaluation and correction of gaps indicated, for substitution of inferences more directly following upon given premises and, primarily, for introduction of better data handling techniques to intelligence analysts. There exists no such feed-back mechanism now. The improvement of IDH techniques, therefore, is only the result of a desire for self-improvement on the part of individual researchers and analysts; the essential catalysts of expressions of user dissatisfaction and user pressure are lacking.

F. Conclusions Regarding Conceptual and Managerial Considerations

1. The Task Team has concluded that there is an urgent need for a range of actions aimed at improving the intelligence community's capabilities to formulate and manage sound IDH research and development programs for increased effectiveness and economy. This conclusion recognizes the rightful importance of IDH-R&D, the need for sharing IDH-R&D responsibility with groups outside the USIB community, the lack of any existing USIB goals, policies or supporting managerial mechanism to further necessary R&D, and the general lack of coordination among existing or planned R&D efforts. The Team's conclusions regarding the managerial and conceptual considerations of IDH-R&D focus on three primary levels of activity, i.e., individual agency activity, the interactions between agencies of the intelligence community, and the relationship of the intelligence community with non-intelligence activities both in the Federal government and in industry. Specific conclusions are:

a. USIB (via CODIB) should encourage USIB members to identify a mechanism within their organizations responsible for forumlating IDH-R&D objectives and policies, coordinating with supporting R&D laboratories and facilities to insure achievements of approved objectives, and maintaining liaison with other intelligence agencies and, as required, non-intelligence R&D activities.

b. The agencies and departments of the intelligence community should exchange among themselves technical and planning information concerning their IDH-R&D efforts. Only dissemination of classified information would be involved, and channels affording needed security would be utilized. The notion of a Central Register service for R&D technical and planning

data should be considered seriously. This type of service could be achieved with little added effort by using existing R&D reporting mechanisms within individual agencies and departments, and utilizing an existing handling system such as the USIB File and Program Catalog System to process the data. Initially, "bleed-off" of information from these established systems should suffice and serve to point up new requirements, if any, which should be imposed.

c. It is extremely important that the staff elements responsible for IDH-R&D management maintain a continuous awareness of current and pertinent research and development outside the intelligence community as well as that within the community. Following are specific examples of devices which would materially assist IDH-R&D personnel in this area:

(1) An agreed-upon organizational listing of the IDH-R&D community.

(2) A "phone directory" of IDH-R&D community members showing their recognized specialties and areas of interest.

(3) A listing of the R&D information services (some 400-500) available together with instructions and procedures for their use. (These are generally outside the intelligence community).

The team estimates that the above three devices, together with a follow-up study and evaluation of changes in information usage patterns of IDH-R&D personnel due to dissemination of the devices, could be developed by contract at a cost of $15Ø,ØØØ (plus the full-time managerial services of two intelligence community personnel) in about nine months.

d. There is a need for a feedback mechanism between the users of finished intelligence estimates and IDH-R&D personnel for the purpose of bringing pressure to bear on efforts to improve IDH techniques and systems in support of estimative processes. The Team estimates that the analysis to establish a base for such a mechanism would require the part-time

services of 3-5 experts from the USIB IDH community for a period of about one year plus two full-time outside experts at a cost of approximately $75,ØØØ.

G. After a review of these conclusions bearing on the conceptual and managerial aspects of IDH-R&D, one should rightfully ask what would be the harmful implications of ignoring them or taking no action to correct deficiencies in IDH-R&D. The Task Team has considered this question and believes the following to be the consequences of inaction:

1. The intelligence community would continue to be vulnerable to external investigative and evaluative groups without having any recognized negotiating position from which to staff questions concerning intelligence data handling. The product of the intelligence community is information. The field of information sciences and services is a highly populated one in the scientific community. Intelligence data handling R&D is analogous to information sciences technology, and so one can expect a high interest in the intelligence data handling R&D activities of the intelligence community. Such interest is good and should be maintained; and investigations can be extremely productive provided that a true picture of IDH-R&D is presented to investigators and evaluators. This has not been the case in the past. Probes could be aimed anywhere with equanimity by external groups since there was no policy mechanism having information, data and coordinating responsibilities concerning intelligence data handling R&D. It is implicit in management doctrine that deficiencies are less when there is a responsible coordinating mechanism and that those deficiencies which do exist are both easier to find and to correct. It would be of help, therefore, to both external investigative groups and to USIB to have established R&D objectives for IDH and to have a known organizational structure within USIB agencies to call upon. Regardless of how well-intentioned the external group may be, when it is presented data which are fragmentary and not inter-related, the group's recommendations are of necessity even more fragmentary and less related to the real problems. They will "remove a thorn and by so doing implant a tumor".

2. The deleterious effect of having no overall recognition of USIB agency objectives or policy in IDH-R&D can be seen, if not heard, at every level of the R&D hierarchy and will continue if corrective action is not taken. Examples of this unhappy

situation are given below:

(a) There is no real structure on which to discuss R&D efforts other than the ephemeral structure of satisfying users' "requirements".

(b) A rather lamentable and frequent occurrence is the lack of any criteria against which to judge when a particular R&D effort has been completed or should be terminated.

(c) Security barriers are used quite effectively to counter attempts by other agency personnel to acquaint themselves with on-going R&D efforts.

(d) Whatever IDH-R&D objectives and policies do exist are frequently little more than empty statements. They may be so broad as to be meaningless, as for instance, "the improvement of intelligence data handling capabilities within the intelligence community". Conversely, they may be so narrow as to preclude adequate coverage of all of IDH even by the use of a number of statements of objectives.

To be useful, IDH-R&D objectives must provide means of ensuring best possible use of R&D laboratories, facilities, funding and manpower; they must encourage interagency communication and coordination; they must emphasize maximum use of resources and results found external to the community; they must require interchange between the community and other governmental agencies and between the intelligence community and the scientific community; they must support federal objectives; and they must permit measurement of the impact of their pursuit on agency resources and on USIB community requirements. Without such policy and objectives, IDH-R&D will founder as more expensive equipment development and more complex and intellectually demanding technology sucks up more of the available community resources even without duplicative and unjustified efforts by individual uncoordinated agencies.

3. As mentioned above, technology and R&D are becoming more expensive both in talent and funding. The last ounce of usefulness must be realized from every project. The IDH-R&D community has to become better informed of completed and on-going R&D efforts everywhere. As a rough estimate, one tenth of one percent of the funding isolated for IDH-R&D in FY66, if

spent on improvement of information usage patterns by IDH-R&D personnel, would permit each member of the IDH-R&D community the equivalent of a full semester's worth of college-level education each year. The improvement in the resultant R&D effort would conservatively be 100 - 1000 times that expenditure. The distribution of a listing of information services available and the encouragement of their use seems a trivial but necessary first step in community self-improvement.

4. It would be presumptious to attempt to clarify a need that is as widely evident as that of a workable feed-back mechanism between users of finished intelligence and the personnel responsible for improving the use of intelligence collected.

H. The Task Team believes that the conceptual and managerial considerations discussed in this Section are vital to a healthy and constructive intelligence data handling research and development program aimed both at USIB community and at member agency needs.

III. Technical Considerations

A. Classification and Definition Schemes and Resulting Implications.

1. One would anticipate that technical aspects of intelligence data handling R&D should include a classification of the subject area, an identification of importance of the R&D areas involved, an isolation of gaps and deficiencies in R&D, a state-of-the-art survey and recommendations concerning needed efforts or skills. The Task Team had somewhat spotty success in its consideration of such technical aspects.

2. Members of the Task Team were aware of several attempts underway to develop classification schemes for information sciences and believed that the intelligence community should encourage this activity and rely on the results rather than to produce separately a taxonomy or classification for intelligence data handling. It was felt that "intelligence data handling" overlapped in content many of the areas characterized by more widely used phrases such as "intelligence processing", "information sciences technology", "information systems", "non-numerical processing" and the like. Several classification schemes already developed or utilized were collected and were used by Team members in helping to resolve jurisdictional questions concerning the scope of intelligence data handling. Nine of these are attached as Appendix 4 but none are believed to be entirely satisfactory for classifying intelligence data handling for the purpose of this report.

3. To provide assistance in assessing the findings of the Task Team, certain exemplary areas have been singled out which are deemed of primary intelligence interest in order to illustrate what was considered within the scope of intelligence data handling and, more particularly, what was considered outside the scope. Examples of equipment or processes considered outside the purview of the Team include:

(a) Data handling equipment whose sole purpose is that of guidance and sensor control of reconnaissance platforms.

(b) Communications-oriented EDP equipment such as switching computers and store-and-forward message devices.

(c) Physical security devices or techniques, e.g., COMSEC.

(d) Optical devices such as cameras and stereometric viewers.

(e) Data processing methods associated with collection sources used primarily to aid in the collection function.

(f) Signal recording equipment and techniques forming an integral part of any collection process.

(g) Data intercept techniques or equipment.

4. Examples of equipment or processes which might be considered to be outside but which were finally considered to be within the scope of intelligence data handling include:

(a) Automated map making equipment

(b) Pattern recognition techniques and equipment

(c) Analog-digital conversion equipment utilized within IDH systems

(d) Signal extraction and recovery equipment and techniques

(e) Polygraph R&D

(f) Error coding and analysis

(g) Experimentation and evaluation efforts

(h) Photo chip handling equipment.

These examples serve to clarify the definition of intelligence data handling adopted by the Task Team and approved by CODIB and which is stated in the Introduction to this report (Section I).

5. It was apparent, however, that neither the adopted definition of intelligence data handling, the various classification schemes in Appendix 4 nor the exemplary approach above served to identify areas of intelligence data handling R&D so as to relate them to managerial responsibilities, to applications, to intelligence products or to current funding breakdowns. The Task Team, after a great deal of deliberation, chose two methods for identifying what it believed to be separable technical entities falling within the domain of intelligence data handling. The first of these methods demanded

separation by application[1] and was used for funding breakdowns as well as to identify gaps, deficiencies and needed R&D. Twenty-two such applications were enumerated and are contained in Table III.1 with a very cursory definition. It is interesting to note that the application listing was provided to the Task Team at its initiation and that no changes were made in its make-up during the entire work-period of the Team. The listing was a subset of a listing derived by the Chairman in 1962 to cover Military Applications of EDP- and EDP-Related Research and Development. Its companion piece, also used by the Task Team, was a listing of information by source data types and is contained in Table III.2 for reference purposes. The second method was intended primarily to indicate to management the extent to which intelligence data handling R&D could improve intelligence production and management within the intelligence community and should be so presented at this point in the text.

6. The Task Team believes that intelligence data handling R&D must and should be aimed towards:[2]

a. Experimentation with and evaluation of existing data handling techniques, equipment and systems

b. Development of measures of effectiveness and evaluation criteria for design, evaluation and comparison of data handling organizations, techniques, equipment and systems

c. Improvement of management procedures for allocation of resources by and within the intelligence community

d. Analysis and evaluation of data and data source exploitation practices

e. Development and/or evaluation of information and document control, handling and dissemination techniques, procedures and systems

---

1 "Application" as used in this context itself contains some ambiguity. It may refer to either a specific intelligence community application (or function) or it may refer to a particular set of scientific and technical techniques or applications. An example of the former use is "calculation of location of fixed objects"; an example of the latter use is "pattern recognition".

2 In all cases enumerated below IDH-R&D is assumed to involve development of theories, advanced techniques and equipment and their application to the subject area listed. As such, basic research may be required and justified for the intelligence community.

f. Improvement of organizational structures for performance of intelligence community functions

g. Improvement of techniques for deriving finished intelligence and intelligence estimates including evaluative procedures; (e.g., quality control).

h. Development of validity criteria for information including criteria for data purging

i. Development of improved learning and teaching procedures for intelligence personnel (e.g., programmed instructions)

j. Development of reporting mechanisms for R&D project funding and managerial data.

7. The above listing served to highlight the findings of the Task Team concerning R&D resources within the intelligence community. Namely, R&D resources appear to be split into the functional areas of 1) collection (or acquisition), 2) information (or data) handling and 3) specific research studies in support of intelligence production. Examples of the latter include economic research studies, psychological warfare studies, cultural pattern studies and the like. The data-handling functional area has the greatest diversity and consequently affects the greatest number of personnel within the USIB community. There is no question that, as the area exists in reality and as it has been defined by the Task Team, it is too large and diverse to be managed effectively as an entity. There is also no question that, as its many constituent parts become more sharply defined, it will and should itself split so as to be more manageable. The greater danger at the moment, however, appears to be that a number of essential areas requiring improvement are being neglected because they are not collection oriented, are not research studies and are not thought of as being a part of intelligence data handling because of the parochial and limited view taken by many towards the intelligence data handling R&D area. It was concern over this danger that prompted the above listing.

8. Another aspect of intelligence data handling R&D which was highlighted by the last listing was the transcendent nature of such R&D. By this is meant the unmistakable realization that IDH-R&D transcends the responsibilities and missions of individual USIB agencies and is indeed of USIB community concern. Almost without exception the product of a given agency forms merely one part of the desired intelligence product which becomes of necessity a community estimate or product rather than an agency estimate or product. The implication of this finding is as important as any generated by the Task Team. It underlines the need for R&D projects of a given agency (with a few exceptions) to be based on the recognition of related requirements of other agencies, it emphasizes the necessity for community priorities to be put eventually on R&D rather than individual agency priorities.

TABLE III.1 INTELLIGENCE DATA HANDLING RESEARCH AND DEVELOPMENT CLASSIFIED BY APPLICATION

1. Calculation of Movement and Location of Known Mobile Objects

2. Calculation of Movements and Locations of Unknown Mobile Objects (involves enemy air, ground, sea and space movements)

3. Calculation of Location of Fixed Objects

   a. Identifiable by Non-Geographical Characteristics (Radar)
   b. Identifiable by Geographical Characteristics (Targets)

4. Calculation of Quantitative Characteristics of Objects (May involve detection range, frequency, vulnerability, etc.)

5. Environmental Calculations

   a. Weather
   b. Fall-out
   c. Nuclear Generated Patterns
   d. Spectrometric Observations
   e. Traffic Patterns, etc.

6. System Monitoring

   a. Traffic Analysis
   b. Space Craft Performance
   c. Lie Detection
   d. Bomb Alarm Systems, etc.

7. Control Processing

   a. A/C Control
   b. Satellite Control
   c. Fire Control, etc.

8. System Management

   a. Collection Management
   b. EDP System Management
   c. Library Management
   d. Dissemination Management, etc.

9. Cryptanalysis

10. Simulation, Experimentation and Evaluation

11. Language Translation

12. Geographical Calculations

    a. Mapping & Charting
    b. Geodesy, etc.

13. Astronomical Calculations

    a. Space Guidance Calculations
    b. Stellar Determination, etc.

14. Image Interpretation

    a. Photographic
25X1 b. [redacted]
25X1 c. [redacted]
    d. [redacted]

15. Language Processing (Other than translation)

    a. Abstracting
    b. Indexing
    c. Extracting
    d. Formatting
    e. Condensing, etc.

16. Pattern Recognition

    a. Character
    b. Lexigraphical
    c. Symbolic
    d. Trends
    e. Contour, etc.
    f. Auditory

17. Document Retrieval (includes storage)

    a. Film Chips
    b. Film Reels
    c. Paper Documents (books, reports, messages)
    d. Charts, etc.

18. Information Storage and Retrieval

    a. Text
        1) Formatted
        2) Unformatted
    b. Numerical
    c. Signals
        1) Digital
        2) Analog

19. Predictive Calculations

    a. Indications
    b. Warning
    c. Estimates, etc.

20. Planning

    a. Simulation
    b. System Design
    c. Financial
    d. Contingency and/or Operations
    e. Targetting
    f. Penetration

21. Problem Solving

    a. Intelligence Analyses
    b. Inductive Processes
    c. Inferential Decision-Making
    d. Fragmentary Data Analysis
    e. Attack Assessment
    f. Strike Assessment, etc.

22. R&D Support Service for Other Listed Applications

TABLE III.2 INFORMATION CLASSIFICATION BY SOURCE DATA TYPE

1. Textual

   a. Free Text
   b. Unformatted but Subject Oriented
   c. Formatted
   d. Code

2. Numerical

   a. Code
   b. Encrypted
   c. Straight (non-code and non-encrypted)

3. Alphanumeric
   (Combination of 1 & 2 above)

4. Visual Data

   a. Photographs
25X1 b. [redacted]
25X1 c. [redacted]
   d. [redacted]
   e. Diagrams
   f. Charts and Graphs
   g. Maps
   h. Oscillograms
   i. Fingerprints

5. Electronic Signals

   a. Telemetry
25X1 [redacted]
   b. Radar
   c. Wide-Band
   d. Narrow-Band
   e. Physiological Indicators, etc.

6. Acoustic

   a. Voice or Speech
   b. Sonar
   c. Seismic
25X1 d. Low Frequency [redacted] etc.

7. Documents

(Here the document itself is to be handled as an entity with the information it contains being of no interest)

a. Books, Reports, Papers
b. Messages
c. Film Reels
d. Film Chips
e. Magnetic Tapes
f. Paper Tapes
g. Maps & Charts

B. Discussion of R&D Areas Demanding Increased Emphasis.

1. The derivation by the Task Team of the two methods selected for defining IDH-R&D necessitated considerable research and uncovered certain R&D areas which seemed to demand increased attention under any criteria established. These are discussed in subsequent paragraphs.

(a) Indications and Warnings

(1) Efforts to improve the processing of current intelligence information for purposes of indications and warning have been underway since 1959. Although millions of dollars and hundreds of man years have been expended in applying ADP to this effort, results to date have been disappointing. Because of this, the level of funding in support of R&D efforts in this field is currently low.

(2) In analyzing the reasons for past failures, it should be recognized from the start that the area of indications and warning is one of the most difficult in the entire field of intelligence processing. It is characterized by the following:

a. Extremely high volumes of data to be processed

b. Wide variety of inputs, processes, and outputs

c. Tendency of inputs to be fragmentary, redundant, and of unknown validity

d. Dependence on all types of collection sources

e. Severe time restrictions on processing

f. Great importance of random and rare events

g. Tendency toward rapid changes in focus of attention

h. Heavy dependence on predictive evaluations.

(3) Added to the inherent complexity of the processing problem has been the inadequacy of the preliminary study which has been undertaken prior to system design. Normally, the intelligence objectives have been stated in such broad terms as to be practically useless to the system designer. The system designer has normally been versed in specific technologies but not in intelligence. The intelligence analysts have known very little about current technology and have been so hard pressed to keep up with current events in their areas of specialty that they have not been able to spare sufficient time to guide the system designers. System designers have concentrated heavily on statistical techniques, particularly with reference to levels of military activity. These techniques are frequently dangerous for such applications because they tend to obscure anomalies rather than to highlight them. The warning problem is more a problem of logical inference than of statistics.

(4) Then, too, evaluations depend principally on the talents of the analyst -- his inventiveness and imagination -- his ability to sense a pattern quickly -- his inductive reasoning -- in short, his intelligence. Research and development activity in this field must deal, therefore, with Human Factors studies to a large degree. While Human Factors is an area in which there is much to be accomplished, it has been found to be a most difficult area in which to accomplish much. The human subject is variable and difficult to predict, so that studies have resulted in generalizations rather than conclusions. It is believed that, for this reason, the spate of Human Factors work in recent years has led to a considerable amount of disillusionment. Several topics can be suggested in this area that do offer promise and should be considered in an R&D approach.

a. Data Presentation. Many automated techniques are now implementable which can ease the burden of the analyst in his rapid handling of large volumes of data. Information can be entered into a data store by prearranged formats so that data on a particular topic is available in cumulative form immediately. Large amounts of information can be observed in simplified structure by automatic arrange-

ment into graphical map and chart form. Direct comparisons among fields of information can be made by combined displays and overlays. Time comparisons in the same field of information are similarly available by use of combined displays.

b. Time Compression. Trends which may be too subtle for the analyst to note with the orderly passage of time may be amplified to a level of recognition by the use of time-compression techniques. Chronologically successive displays can be viewed in a greatly accelerated time frame and this process can be repeated and even reversed at the analyst's desire. These techniques are programmable on a computer whose data stores are properly arranged. In addition to increasing an awareness of past trends, it might be useful in suggesting future trends, much like the procedure for extrapolating a graph beyond its plotted positions.

c. Query Languages. Not only have computers become more powerful and economically available in recent years, the methods for utilizing them have been greatly simplified. The recent advances in query languages permit direct and immediate intercommunication between operator and computer so that the computer serves as a direct adjunct to, and tool of, the operator. It is now possible, therefore, for an analyst to "game" a complicated problem, in which many variations in probabilistic data can be considered in fragmentary data analysis.

d. Communication Fundamentals. The process of communication among people involves far more than the simple transfer of information. To be considered fully successful it must create a chain or network of understanding. The physical sciences have accomplished the task of transferring information. The behavioral sciences have not been as successful in the matter of fostering understanding. This is a critical handicap to the analyst who is seeking to establish meaning from fragmentary information. Very many topics for R&D studies in the behavioral sciences

are available. Examples of questions which such studies might answer include 1) Would the establishment of common goals improve the nature and quality of information exchanged among people? 2) Would the opportunity for personal contact improve the overall understanding? and 3) Would group activity among analysts (like "brainstorming") provoke ideas, heighten the imagination, and contribute to solutions? The contribution of the social psychologist in this field may be considerable.

(5) If one were to attempt now to design an ADP system to assist the analyst in the function of warning and indications, the following methodological considerations would have to be taken into account:

a. Document search

b. Interrogation of intelligence analysts

c. Observation of existing manual analytic processes

d. Experience with operational systems

e. Research on types of indicators

f. Analysis of the intelligence "infrastructure" which must support the system

g. Manipulation of the ADP system under laboratory conditions.

(6) To date, system designers have confined their efforts almost exclusively to the first four methods, probably because these are generally straightforward and the least costly. Inadequate effort has been expended on methods (e) and (f), and virtually none on method (g). The result has been that the objective of system design has amounted to little more than an attempt to automate some part of what is already being done manually. The value of such an objective is highly questionable, given the inherent superiority of the human mind over machine capability in such areas as judgment, imagination, and inductive reasoning.

(7) With reference to method (e) above, lengthy lists of indicators have been prepared by various intelligence organizations, including USIB. However, the individual indicators have comprised general statements of ominous events or conditions which it is assumed would occur prior to hostilities. Until recently, very little effort was expended on developing lists of specific phenomena which individual collectors should look for as evidence that these ominous events or conditions are taking place. Thus, what is needed in the indications and warning field is extensive research on "indicators of indicators," the forwarding of individual items on such lists to appropriate collection activities, a reporting system designed to permit rapid communication and processing, and extensive collation of such indicators in the respective indications centers.

(8) In reference to method (f), the success or failure of any automated system is heavily dependent on the related intelligence infrastructure -- coding systems, field formatting of messages, communications systems (including digital data links), interface between intelligence organizations, etc. Yet, system designers working in the field of current intelligence have traditionally confined their focus of attention to the information within a given intelligence organization and treated that organization as though it were an isolated entity. The result has been that, on the one hand, only a part of the data which could be made available on any given subject ever enters the system; and, on the other hand, the effort required to convert into machineable form the information which is available swamps the personnel assigned to the task. Only by treating a given subject area (e.g., Cuban Ground Forces order of battle) in its totality can an effective ADP system be developed for that subject.

(9) Finally, with reference to method (g), all too little effort has been expended in attempting to analyze in depth the present methods of analysis utilized in current intelligence. It is unlikely that this can be done in the operational environment of any given indications center because research and development cannot be permitted to interfere with the ongoing, day-to-day work of such centers. What is needed, therefore, is the testing of present techniques of analysis in a separate facility (laboratory) using live

information, and the comparison of the results obtained with the day-to-day products of the present indications centers. In this manner, some of the areas which today are considered so difficult but which seem to offer great potential, such as the cross correlation of different subject files (e.g., personnel movements with missile tests), can be tested in depth.

(10) In summary, although the results of past efforts designed to improve processing capabilities for current intelligence information have been disappointing, the task is not impossible and the general lines of approach for improvement can be drawn. It is believed that the present range of manual analysis can be extended significantly by these new approaches.

(b) Photo Interpretation.

(1) Photo interpretation has always been a manual task for which algorithmic procedures have generally been assumed to be impossible. Automated aids for photo interpretation are of recent origin and are generally based on a replacement of the man by an automated device. No automatic image recognition aids have proved feasible in operational situations. However, more resources are still expended on such automation than are assigned to the study of the nature of photo interpretation, its essential features, those aspects most difficult for a man and the characteristics of "successful" manual procedures. For instance, estimates of "overlooked" information after a "successful" manual interpretation run as high as 40%. The criticality of this situation is heightened by the fact that photographs provide one of the best -- if not the best -- direct sources of intelligence now available.

25X1

25X1

25X1

Intelligence analysts usually must make inferences from indirect data or observations as opposed to direct observation possible from photographs. Another factor that makes the present photo interpretation problem more severe is that photography is generally quite current and comprises one of the most voluminous sources of data. A no less important consideration is that many top decision-makers place more reliance or credibility on photographic evidence than on any combination of indirect evidence.

(2) The Task Team has concluded that improvements in the photo interpretation process could be achieved by the following types of IDH-R&D activity:

a. Provide formal descriptions of both utilized and feasible procedures for photo interpretation.

b. Evaluate and experiment with procedures that can be formally described.

c. Determine critical areas (where procedural changes or automated aids will alleviate problems) and initiate the required R&D.

d. Put more emphasis on research into "human factors" aspects of photo interpretation. (N.B., this added emphasis is actually occurring now at NPIC and OSD).

e. Determine the essential characteristics of various types of photo interpretation such as target (object) location, area discrimination, feature detection, moving target indicators, etc., and initiate R&D to effect improvements.

f. Determine improved instructional techniques for photo interpreters; and

g. Improve the document and information storage, handling and retrieval aids available to photo interpreters.

(c) Experimentation and Evaluation.

(1) Mistakes will be repeated unless they can be identified as such and made known to others who are attempting the same job. Although lip service is paid to this fact, most groups invoke the rule that finding their mistakes is less important than proceeding and that if mistakes are found, any revelation of them would be harmful to the group and should, therefore, not be condoned. As a result, very few intelligence staffs permit realistic evaluations of their practices or products and results of any evaluation are usually

tightly held. The IDH-R&D community cannot afford the existence of such agency or group "pride". Experiments and evaluations of existing systems and of systems in design stages must become a matter of policy and system practice. Much R&D must be done on experimentation and evaluation techniques, however, before any policy can become binding. In the 11-14 year history of formalized IDH-R&D, very few such efforts have been spontaneously sponsored, and very few resources have been allocated to R&D on experimentation and evaluation. The Task Team believes that such R&D must be declared mandatory before it will ever be adequately supported. In particular, the Team concludes that experimentation with and evaluation of the following type systems or organizations should be undertaken:

a. Document Control and Dissemination System[1]

b. A Warning and Indications Organization[2]

c. A Scientific and Technical Intelligence Production Organization, and

d. A Multiple-User Automated System.

Simultaneously, the Team concludes that a concerted R&D effort should be initiated to improve experimentation techniques and to develop measures of effectiveness and evaluation criteria for information systems in which man plays a role. To the best of the Team's knowledge no such measures or criteria have been accepted as useful, and R&D underway is uncoordinated and of unknown value.

(d) Modelling and Simulation.

(1) There are a number of advocates both within and outside the intelligence community who espouse modelling and/or simulation as the most effective means of evaluation and experimentation. There are, of course, many types of modelling possible; so that one of the first steps in the use of modelling is to determine the

[1] Underway now in DoD
[2] Attempted by CIA in 1962 but with no usable results

objective desired and the most simple model which will permit the attainment of the objective. This is the step often overlooked by those who advocate modelling and who find themselves trying unsuccessfully to justify the modelling of the entire intelligence community as a first step towards some objective whose immediate context is much smaller than the whole of the intelligence community. The collection of data and facts about the real-life environment of which the model is intended to be an image is, of course, essential. The rate and amount of collection possible should be recognized as a constraint upon the model prior to its initiation. Otherwise one who collects such data may find that he is in the predicament of the Alice in Wonderland characters who had to run as fast as they could to stay in place and who would have to run twice as fast to get anywhere. This simply implies the impossibility of freezing a changing environment over too long a data collection period. Finally, since modelling is an experimental technique, there must be an hypothesis advanced against which the model is to be tested. If this is not recognized, the model will generally be merely a mechanism for data collection and for the generation of conclusions in an unpredictable framework. With these admonitions in mind the Task Team believes that limited modelling against formulated hypotheses would be a useful technique for determining bottlenecks, gaps or deficiencies in the intelligence process. R&D could then be initiated against known requirements which were experimentally derived rather than subjectively generated. Figure III.1 contains an illustrative model of the intelligence process developed for the Task Team. Any node of the model may be selected, its immediate constituent environment determined, an hypothesis generated and data collected with results which could lead to valid requirements for IDH-R&D. Accordingly, the Task Team has concluded that several limited models against formulated hypotheses should be attempted by IDH-R&D groups within the intelligence community under the aegis of the recommended USIB community policy mechanisms and that this be done during the next two years to preclude further unwarranted large-scale system or equipment design projects.

(2) The four areas isolated above as demanding increased emphasis by the IDH-R&D community could surely be augmented by any group having a longer life and more

Next 1 Page(s) In Document Exempt

Approved For Release 2006/09/25 : CIA-RDP80B01139A000300050006-0

available resources than did Task Team VI. The Task Team itself identified many more areas in need of R&D but whose justification varied widely depending upon the criteria used for evaluating their urgency. These requirements are not included in the report and must await the convening of a more enduring group.

(3) For a summary review of Intelligence Data Handling Research and Development Potential the reader is referred to Appendix 2.

IV. Allocation of Resources

A. Funding.

1. Techniques Used in Collecting Funding Data.

(a) Funding data was collected by agency and application area for the various intelligence data handling research and development (IDH-R&D) efforts, identified as falling within the purview of this task team. Table IV.1 reflects the totals by application areas.

(b) Wherever possible, currently available funding figures were collected and used in accumulating the total IDH-R&D expenditures. In certain instances, funding data were not available or were only partially usable. This occurred when addressing newly established projects, which had not been completely defined and when addressing individual tasks within a given project. In such cases, except for NSA and CIA, the funding data were obtained from the task/project officer of the sponsoring service/agency concerned. When this recourse failed, it was necessary to extrapolate the funding data from currently available technical development plans and RDT&E project reports (DD613's and/or DD1498's in the case of DoD). Available DoD figures were used for appropriate NSA tasks and projects.

(c) Selected tasks/projects were evaluated, to the extent that they supported each of the application areas. It should be noted that this division and allocation of individual task/project efforts into the various application areas involves a measure of human judgment which must be taken into consideration. The associated task/project funding was divided also on a somewhat qualitative basis and was placed into the appropriate application areas.

2. Analysis and Conclusions.

(a) Primarily, the largest IDH-R&D expenditures are in those R&D areas where the Team has concluded that the intelligence community should be essentially self-sufficient. The one exception is the area of warning and indications (See Section V).

(b) It should be noted that within the Systems Management area, no funds are allocated to Library Management,

suggesting that the processes and techniques required in this area are either being satisfactorily developed outside R&D mechanisms or need further identification for R&D funding.

c. Other conclusions concerning relative funding for different application areas, are easily derived from direct observation utilizing the second and third columns of Table IV.1 which list absolute funding and rank order of the application areas respectively.

d. The Team believes the funding figures to be accurate within 50-100% of actual costs. Accordingly, conclusions should be drawn cautiously from Table IV.1. The funding errors are probably evenly distributed so that the rank ordering of application areas can be used for comparative purposes.

Next 1 Page(s) In Document Exempt

Approved For Release 2006/09/25 : CIA-RDP80B01139A000300050006-0

2. Since the Task Team believes its figures to be in error possibly by as much as 40% it will draw no conclusions from these data. The errors appear to arise primarily because of inability to determine that portion of an individual's time which is assigned to IDH-R&D when IDH-R&D is not his total responsibility. This is especially true in the case of management personnel.

3. The Task Team believes that the organizational data and charts of Appendix 1 should be clarified and validated through official USIB channels as soon as possible as a starting point towards understanding and improving the IDH-R&D community.

V. The Self-Sufficiency of the USIB Community in Intelligence Data Handling Research and Development

A. In Section II it was stated that the greater part of the technical competence in general information handling (or information sciences technology) lies outside the intelligence community. In both Section II and Section III it was emphasized that many aspects of intelligence data handling are identical to those of general information handling, and the research and development objectives of one are directly applicable to the other. For example, developments in multi-font and all-font optical print readers are needed to improve general information handling. They are needed for intelligence data handling also. New storage media, large random access memories, language translation and man-machine communications are further examples of areas where improvements will benefit the entire information handling community. However, there are areas in data handling where the intelligence community should or must be self-sufficient in research and development. Identification of these areas will allow management to concentrate limited intelligence community resources in areas where the investment return will be of maximum benefit to USIB community intelligence objectives.

B. Determining research and development areas where the intelligence community should be self-sufficient requires weighing the particular area against the following criteria:

1. Are the requirements, techniques and/or processes essentially unique to the intelligence community?

2. Are the classification safeguards such as to preclude participation by groups outside the intelligence community?

C. On the basis of these criteria, the Task Team believes, as a result of its investigations, that the intelligence community should be essentially self-sufficient in the following IDH-R&D areas:

1. Photo-Interpretation Aids
2. Mapping and Charting
3. Cryptanalysis
4. ELINT Handling
5. Signal Analysis Aids
6. Warning and Indicator Aids
7. Utilization of Human Resources for Intelligence Data Acquisition and Exploitation

D. Before discussing these areas, it should be understood that the Terms of Reference (Appendix 3) for the Task Team limit its area of responsibility. The intelligence process can be considered as a four step cycle of collection, processing, analysis, and production with a dissemination cycle overlapping all four steps. The Terms of 25X1 Reference eliminate collection from consideration by the Task Team. The other steps in the cycle which the Task Team did consider involve the transformation or reduction of all forms of collected data -- [redacted] (See Table III.2) -- usually to numbers or to English language. They also involve the coding and indexing of the reduced data so that it can be retrieved and/or correlated with subsequent presentation to users. Therefore, while the following discussion covers each of the areas requiring some R&D self-sufficiency, it must be remembered that this Task Team is only concerned with the areas that conform to the definition of intelligence data handling in the Terms of Reference. The responsibility for research and development in some of these areas is wholly or partially covered in the NSCID/DCID series, and governmental R&D efforts have been assigned as responsibilities to specific governmental agencies. For example, Photo-Interpretation Aids are covered in NSCID #8 and Cryptanalysis and ELINT Handling are covered in NSCID #6 (see excerpts in Section II). In part, Signal Analysis Aids and Warning and Indicator Aids could also be considered under these two NSCIDs. Accordingly, the ensuing discussion of the areas in which essential self-sufficiency is required of the intelligence community is confined solely to technical considerations.

1. PHOTO INTERPRETATION AIDS is an area requiring self-sufficiency. Although there are non-intelligence requirements for such aids -- e.g., U.S. Coast and Geodetic Survey, Forest Service, etc. -- none has the problems of volume, timeliness, high degree of accuracy and tight security restrictions on both collection and exploitation that are imposed on the intelligence community. Self sufficiency has been accepted as a necessity and, in large measure, has been attained.

2. MAPPING AND CHARTING contains many of the elements affecting Photo-Interpretation Aids -- e.g., volume, accuracy, timeliness and security. While there are non-intelligence efforts in Mapping and Charting, none of them have the requirements for charting and targeting remote areas, for timeliness is satisfying tasking, etc., that exist in intelligence. In addition, inputs to the Mapping and Charting function, in many instances, are data from unconventional collection sensors that require unique mapping and charting collection and exploitation techniques.

3. CRYPTANALYSIS requires self-sufficiency under both criteria. It is definitely a unique area in that there is little non-intelligence requirement, and it is also an area which is highly classified and closely controlled as to requirements and techniques.

4. ELINT HANDLING is an area for self-sufficiency. The nature, volume and timeliness of the data, differing uses for the same data, different means of capturing and storing the data and the wide dissemination necessary all serve to emphasize the need for self-sufficiency.

5. SIGNAL ANALYSIS AIDS require self-sufficiency. Again, there is effort in the non-intelligence community in signal analysis. Examples that arise include speech therapy work, radiation interference analysis, and scientific investigation of nonhuman vocalizing (porpoises). However, the non-intelligence effort does not concern itself with the quantity or the quality of the effort required by intelligence. These factors require that the intelligence community develop a self-sufficiency in research and development.

6. WARNING AND INDICATOR AIDS is a unique area requiring self-sufficiency in the intelligence community. The need exists for correlating and evaluating large quantities of data from various types of sensors and doing the correlation and evaluation on a real-time basis. The function of warning and indications is an assignment unique to the intelligence community.

7. UTILIZATION OF HUMAN RESOURCES FOR DATA ACQUISITION AND EXPLOITATION is an area almost unique to the intelligence community. Although the business community must perform market research and police departments must collect their data via similar means, their sources permit different collection and exploitation techniques. "Acquisition" here is used in the sense of "information transfer" and not in the traditional intelligence sense. Methods of query, of information transfer, of interview techniques of remote interrogation (via remote polygraph techniques, for example) and unconventional methods of data exploitation are all involved. It is essential that self-sufficiency be attained by the intelligence community in this area.

E. It should be noted that throughout the preceding discussion the notion of "essential" self-sufficiency was implicit and was used intentionally as distinct from "complete" self-sufficiency. This is due to the well-accepted tenet that all the uses of a particular area of research can never be predicted. As a result, improvements

or even breakthroughs in any of the above areas could result from research done in completely distinct areas not within the purview of the IDH-R&D community. Recognition of this situation serves to point out why only seven areas were singled out by the Task Team as requiring essential self-sufficiency on the part of the intelligence community and leads naturally to a discussion of the overlapping interests of the Intelligence IDH-R&D community and the remainder of the Scientific and Technical R&D Community.

F. The Task Team found it difficult to provide a measure or an indication of the overlap of interest between IDH-R&D and other R&D communities. To get a first handle on this overlap it was decided to utilize the National Science Foundation publication Current Research and Development in Scientific Documentation, No. 13, November, 1964, as the most comprehensive and accurate listing of ongoing R&D in its area of coverage. The R&D areas covered in this publication are:

Information Needs and Uses
Information Storage and Retrieval
Mechanical Translation
Equipment
Character and Pattern Recognition
Speech Analysis and Synthesis
Linguistic and Lexicographic Research
Artificial Intelligence, and
Psychological Studies

Some 495 projects were covered in the publication and each one was reviewed individually with regard to its relevance to IDH-R&D. Of the 495 projects, 462 were judged relevant (i.e., of use to) IDH-R&D interests. This implies that 93 per cent of the known ongoing R&D in information sciences is of potential use or interest to IDH-R&D. Furthermore, a large percentage of this R&D (more than 75 per cent[1]) was sponsored by R&D organizations outside the IDH-R&D community. Approximately 30 per cent of the projects involved research and development in information storage and retrieval. The areas of information needs and uses, mechanical translation, character and pattern recognition, linguistic and lexicographic research, and artificial intelligence each contributed approximately 10 per cent of the number of projects examined. The judgment of relevance invoked in the analysis is, of course, subjective, but the Task Team has its findings tabulated and can, therefore, provide a listing of relevant projects and can state that the analysis is a reproducible one.

[1] Based on a random sampling of the 462 projects.

G. The findings of this Section, namely, the isolation of seven IDH-R&D areas in which the USIB community should be self-sufficient, along with a measure of the large degree of overlap between IDH-R&D and information sciences R&D lead to two conclusions.

1. The larger portion of IDH-R&D resources should be allocated to the seven areas requiring self-sufficiency. (The findings of Section IV on current funding allocation indicate that R&D resources appear to be properly assigned. However, more analysis is necessary to demonstrate the existence of useful products and to ensure continued maintenance of this allocation balance).

2. Lists of available information services and usage procedures (Section II, para F) should be produced and disseminated as quickly as possible.

VI. Intelligence Data Handling Processes

A. Those types of data which contribute most to intelligence production have been determined to be natural language text, imagery, digital and analog signals, and derived prescribed reporting (e.g., Information Reports). There appear to be a denumerable set of operations to which these data types are subjected from the time they enter the intelligence production cycle upon receipt from collection until they are presented in final form to their ultimate users. These procedures may be classified in many ways. One way which has proven quite valuable in highlighting the type of research and development needed is a classification based on the degree of intellectual activity required in the performance of the procedure. Three levels of intellectual activity have been successfully used to separate into groups the more important procedures identified in the overall intelligence data handling process. These levels, simply labelled first, second and third levels, can be qualitatively distinguished as follows:

1. First level of intellectual activity - not describable either as an algorithmic or a heuristic process. It appears to require human intelligent behavior to a great extent.

2. Second level of intellectual activity - Allows algorithmic or heuristic solution but only under control of human intelligent behavior or through human intervention during the process. It requires an effective man-machine dialogue when "machines" are utilized.

3. Third level of intellectual activity - frequently is of a repetitive, clerical or mechanical nature. It is completely algorithmic in nature and any human intelligent behavior required can be adequately simulated by "machine".

B. Table VI.1 presents some fifty-five different procedures categorized in these three modes. It should be evident that (1) the procedures occasionally repeat in more than one of the categories, indicating a wide variation in their scope; that (2) a number of the procedures must be defined differently depending on the type data to which they are applied; and that (3) the listing is not all-inclusive. For these reasons, no unique definition of each term is attempted in this report. It is obvious that current practice permits multiple definition of many of these terms so that repetition of procedural titles is found between levels whereas precise definitions of these

procedures would indicate their variance as they are applied using the different levels of intellectual activity.

C. The Task Team has concluded that a clarification of the entire intelligence cycle in terms of information processes involved, and the subsequent elimination of much of the current confusion and lack of preciseness inherent in most descriptions of intelligence applications could be achieved by a project to:

1. define and perhaps re-label the intelligence data handling processes identified,

2. determine those processes critical to different intelligence applications and which are in need of improvement,

3. categorize on-going IDH-R&D efforts so as to identify which processes will be improved by the accomplishment of the efforts, and

4. recommend R&D efforts to improve those processes which are not being improved by the on-going R&D.

TABLE VI.1

Intelligence Data Handling Processes Classified According To the Intellectual Activity Required in Their Application

FIRST LEVEL OF INTELLECTUAL ACTIVITY	SECOND LEVEL OF INTELLECTUAL ACTIVITY	THIRD LEVEL OF INTELLECTUAL ACTIVITY
ABSTRACT	ABSTRACT	ANALYZE
ANALYZE	ANALYZE	ASSIGN FOR PROCESSING
ASSOCIATE	ASSIGN FOR PROCESSING	CALCULATE
CLASSIFY CONTENT	CALCULATE	CLASSIFY CONTENT
COMMUNICATE	CLASSIFY	CODE
DECRYPT	COMMUNICATE	COLLATE
DETERMINE PATTERNS	COMPRESS	COMPRESS
DETERMINE RELIABILITY	CORRELATE	CONVERT
ESTIMATE	DECODE	DECODE
EXTRACT	DETERMINE PATTERN	DISSEMINATE
GENERATE	DETERMINE RELIABILITY	ELIMINATE ERRORS
INDEX	DISSEMINATE	ENCODE
INTERPRET	ELIMINATE ERRORS	EXTRACT
MANAGE	EVALUATE	EXTRAPOLATE
ORGANIZE	EXTRACT	FILE
PRESENT	EXTRAPOLATE	FORMAT
REASON INDUCTIVELY	FILE	GENERATE
RECOGNIZE PATTERNS	GENERATE	GROSS CONTENT SCAN FOR CLASSIFICATION
RETRIEVE	GROSS CONTENT SCAN FOR CLASSIFICATION	INDEX
SEARCH	INDEX	INTERPOLATE
SELECT	INTERPOLATE	LIST
SYNTHESIZE	INTERPRET	LOG
TRANSFER	MANAGE	MATCH
TRANSFORM	NOTIFY	MERGE
TRANSLATE	PRESENT	NOTIFY
	PURGE	PURGE
	REASON DEDUCTIVELY	REASON DEDUCTIVELY
	RECOGNIZE PATTERNS	REDUCE
	REDUCE	REPRODUCE
	RETRIEVE	RETRIEVE
	SEARCH	SEARCH
	SELECT	SELECT
	TRANSFER	SORT
	TRANSFORM	STORE
	TRANSLATE	TRANSFER
		TRANSFORM
		TRANSMIT

VII. Recommendations

A. Previous sections of this report contain numerous conclusions which, because of their specificity, could be repeated verbatim here as recommendations. The Task Team has decided, however, to focus attention on five primary recommendations which ought to be implemented immediately as first steps toward generalized improvement of IDH-R&D. The five selected recommendations are not internally ranked with respect to importance or urgency since the Task Team believes all of them should be adopted. However, there is no restrictive interdependence and any combination of them may be independently adopted. In order that this section can be somewhat self-contained, each recommendation is accompanied by a cursory discussion; detailed discussion and back-up data are contained in the preceding sections of this report.

B. Recommendations for Immediate Implementation

1. USIB (via) CODIB Should Encourage Each USIB Member Agency or Department to Identify an R&D Policy Mechanism Within its Own Organization.

The identification of such policy mechanism for formulating IDH-R&D objectives and policies assumes high priority. Without such groups there is nothing to which the accomplishment of IDH-R&D projects can be related or addressed. Detailed discussions of such mechanisms and the need for them are contained in previous sections of the report (See Section II for details).

2. Coordinated IDH-R&D Actions Should Be Initiated in the Area of Warning and Indications (Predictive Calculations).

More allocation of resources -- both funding and Intelligence Community personnel -- should be directed into improving our warning and indications capabilities as this is one of the foremost functions of intelligence (See Section II. B. 1a). Early expensive failures in this field of IDH-R&D no doubt have resulted in "burnt fingers"; but both techniques and equipment have since improved, and new efforts should be undertaken. Past failures must provide an educational background in avoiding the repetition of previous pitfalls. Efforts undertaken must be coordinated on a Community basis and not be isolated undertakings of a single agency. The input data for warning and indications are recognized as the responsibility of several USIB component agencies. CODIB should assist NSA, CIA and DIA to undertake some coordinated actions.

3. Funding Should be Provided for Preparation of a Report Listing Information Services of Use to the USIB IDH-R&D Community.

A comprehensive report is needed which would list those information services, either sponsored by the Government or which are available by other means to members of the intelligence community and which contain information of use to the USIB IDH-R&D community. The report should include details concerning usage of listed information services. The production of the report should be followed by an R&D effort aimed at determining improvement or changes in the information usage patterns of members of the USIB R&D community as a result of the "forced-feeding" of knowledge concerning available information services via dissemination of the subject report. The Task Team considers it unnecessary to conduct a survey of information usage patterns within the USIB R&D community prior to distribution of the report but very worth-while subsequent to distribution (See Section II). The report would have to be contracted out to an outside group and would require, in addition, the active involvement of selected members from the USIB Community. The report and subsequent survey should not cost over $150,000 for a nine months effort and means for funding should be recommended by CODIB (See Section II).

4. An Evaluation of Two Different Types of IDH Systems Should be Conducted to Determine and Establish Methodology Criteria.

It is proposed that two different types of IDH systems now in existence be singled out and selected for formalized experimentation and/or evaluation. Inasmuch as this has never been done before, there are presently no authoritative criteria for determining what constitutes a reasonable IDH system. In the past, IDH systems have been developed to meet recognized requirements, but without the benefit of established guidelines to insure that the requirement was fulfilled. Consequently, there is an urgent need for CODIB to recognize the need for, and endorse experimental evaluation of at least two different types of existing systems by USIB member agencies. Such systems might include a document handling system, a real time warning and indications organization or a biographic retrieval system.

It is anticipated that these evaluations will be costly both in people and resources, since it will be a first-of-a-kind experience and will demand more diversity of competence of both USIB community participants and contractual personnel than most

R&D efforts. It is estimated that the first attempt should require about two years per system costing about $300,000 for each system. This is in addition to the costs covering USIB community participants who will have to be assigned to the tasks. Considering the extremely large amounts spent in the past on unsuccessful IDH systems developments, the cost is not considered excessive. Rather, the cost is justified simply as a protective mechanism against further proposed system design and development efforts known intuitively to be useless before initiation but for which there is no technical foundation upon which to judge their inappropriateness (See Section III).

5. Establish a Feed-Back Mechanism Between Finished Intelligence Users and Producers and the IDH-R&D Community.

There is presently no established procedure whereby producers of finished intelligence can have their knowledge of general shortcomings in existing operational procedures, practices and techniques translated so as to determine the most rewarding areas of exploitation in IDH-R&D. Such a translation requires inter-personal communication between users and producers of intelligence and IDH-R&D personnel. No satisfactory mechanism exists to measure and make known the results of good or bad usage procedures of existing IDH capabilities in the production of finished intelligence or intelligence estimates. A mechanism is needed (an informal review group is recommended), which would determine whether or not the IDH capabilities were adequately exploited and good usage made of all the available data.

The R&D group would encourage feed-back analyses from the producers of finished intelligence to the IDH-R&D policy mechanism for further study to uncover faults and improve IDH capabilities. This would have many beneficial results to the intelligence community as a whole, resulting in improved IDH capabilities including equipment, techniques and personnel. It is recommended, therefore, that means be provided for finished intelligence producers to work more closely with IDH-R&D groups in order to improve IDH systems. It is believed that the best possible improvement would result from the closer working relationship between finished intelligence producers and IDH-R&D personnel afforded by the existence of an informal review group. However, there is need for an initial analysis to determine feasible feed-back techniques. This will require the part-time services of three to five experts from the USIB IDH community for about one year as well as the full-time assistance of two outside experts at a cost of approximately $75,000 (See Section II).

C. Other Recommendations

1. Following is a brief enumeration of other, more narrowly defined actions which the Task Team recommends be initiated:

a. Establish a formalized reporting mechanism under USIB sponsorship to disseminate IDH-R&D technical and planning information within the community. The notion of a Central Register service for this information should be considered seriously.

b. Publish an agreed-upon organizational listing of the IDH-R&D community.

c. Publish a phone directory of IDH-R&D personnel showing their recognized specialties and areas of interest.

d. Take the following steps to improve the photo interpretation process:

(1) Provide formal descriptions of both utilized and feasible procedures for photo interpretation.

(2) Evaluate and experiment with PI procedures that can be formally described.

(3) Determine critical areas where procedure changes or automated aids will alleviate the problems and initiate the required R&D.

(4) Put more emphasis on research into the "human factors" aspects of photo interpretation.

(5) Determine the essential characteristics of various types of photo interpretation and initiate R&D to effect improvements.

(6) Determine improved instructional techniques for photo interpreters.

(7) Improve the document and information storage, handling and retrieval aids available to photo interpreters.

e. Initiate a community-wide program to prepare models of selected important portions of the intelligence community as a technique for determining bottlenecks, gaps or deficiencies in the intelligence process.

f. Initiate a project to define and perhaps re-label IDH processes, determine those processes critical to different intelligence application and which need improvement, categorize on-going IDH-R&D efforts so as to identify which processes will be improved by the accomplishment of these efforts, and recommend R&D efforts to improve those processes which are not being improved by on-going R&D.